

REMARKS

Applicant and the undersigned are most grateful for the time and effort accorded the instant application by the Examiner. The Office is respectfully requested to reconsider the objections and rejections present in the outstanding Office Action in light of the following remarks.

Claims 1-17 were pending in the instant application at the time of the outstanding Office Action. Of these claims, Claims 1, 4, 5, 7, 8, and 10-17 are independent claims; the remaining claims are dependent claims. Claims 3 and 5 have been rewritten. Applicants intend no change in the scope of the claims by the changes made by these amendments. It should also be noted these amendments are not in acquiescence of the Office's position on allowability of the claims, but merely to expedite prosecution.

Claims 3, 5-7, and 11 stand rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Office states that the language of Claim 3 is vague and indefinite. The claim has been amended to address this issue. The Office states that there is a lack of antecedent basis for limitations in Claims 5 and 6. Claim 5 has been amended to address this issue. Further, the Office Action asserts that there is insufficient antecedent basis for the limitation "restoring the register image" in claims 5, 7, and 11. This rejection is respectfully traversed. As is well-known in the art, a register image is the state of all of the registers of the register stack at a given time. Restoring a register image constitutes returning the values in the registers of the register stack to a

state which they previously maintained. By discussing the allocation of registers in a register stack, it is inherent that a register image is also discussed and maintained by the limitations of the claim.

It is respectfully submitted that the Claim Interpretation set forth in the Office Action (Page 3, 1st paragraph) is not necessarily accurate or supported by the specification of the instant invention.

Claims 1-17 stand rejected under 35 USC § 102(b) as being anticipated by Koblenz et al. (hereinafter "Koblenz"). Reconsideration and withdrawal of this rejection is respectfully requested. Among the many distinctions between the instant invention and Koblenz, the main three distinctions will be discussed below.

As best understood, Koblenz appears to be directed to allocating physical registers within a during compilation of a program by constructing tile trees that correspond to the program, with interference graphs for each tile. The Koblenz trees use bottom-up processing when deciding which variables to spill and use top-down processing where the spill code is located. Pseudo registers are assigned and colored according to the preferences of certain variable for certain registers, such that a tile (representing a pseudo register) at the bottom of a tile tree represents a potentially highly executed code portion. The tiles are ordered from top to bottom b number of executions, the topmost tile corresponding to a code portion executed only once, and the bottommost tiles corresponding to code portions executed the most number of times. This contrasts with

present invention, in which live registers are allocated from the bottom of a stack, and constitutes the first major distinction between Koblenz and the present invention.

Specifically, there is no teaching or suggestion that these tiles (or pseudo registers) of Koblenz that are located at the bottom of the tile tree will be mapped to physical registers that are live at a procedure call as in the present invention. As stated in the specification (page 9, 4th paragraph) live registers are "designated registers for which instructions have been allocated (hereinafter this state is described as being alive) by the calling procedure and that are in use when the call to the other procedure is issued...". Koblenz assigns the bottommost tiles in his tile tree to the most frequently executed code portions, which may or may not be the code portions that are live when a call is executed. Further, Koblenz does not use a register stack, but instead uses a tree, which is a different data structure that uses memory and pointers differently. The usage of a different data structure changes the access, maintenance, and updating methods of the registers.

The second major distinction between Koblenz and the instant invention is illuminated in the differences between the maintenance of the register stack by Koblenz and by the instant invention. Koblenz communicates the local interference graphs that correspond to each tile in the tile tree to parent tiles in register allocation. The instant invention copies the registers residing in the register stack, to free registers located at the bottom of the register stack. Further, the instant invention only frees these registers while there is a vacancy in operation resources. There is no teaching or suggestion in Koblenz of this type of freeing of the registers, and moreover, no teaching or suggestion of freeing registers only during vacancies in operation resources.

Another major distinction between Koblenz and the present invention involves the restoration of the register image from a procedure that was called after another procedure was called and the registers were reallocated. Koblenz only provides for the reloading of individual registers when necessary. The instant invention returns the register stack (which Koblenz does not create or maintain, choosing to use a tree instead) to the state it previously maintained, meaning it returned every register in the stack to the state it maintained during the previous procedure call.

It is respectfully submitted that Koblenz clearly falls short of present invention (as defined by the independent claims) in that, *inter alia*, it does not disclose "performing mapping between said logical register and physical registers, so that said physical registers that are live at a procedure call in said program to be compiled are allocated from the bottom of the register stack" as asserted in the Office Action. Additionally, it is respectfully submitted that Koblenz does not disclose "upon the calling of the procedure, so long as there is a vacancy in operation resources, copying said registers residing in the register stack, to free registers located at the bottom of said register stack" as asserted in the Office Action. Further, it is respectfully submitted that Koblenz does not disclose "upon the return from said different procedure, restoring the register image to the state immediately before the reallocation."

Accordingly, Applicant respectfully submits that the applied art does not anticipate the present invention because, at the very least, "[a]nticipation requires the disclosure in a single prior art reference of each element of the claim under construction."

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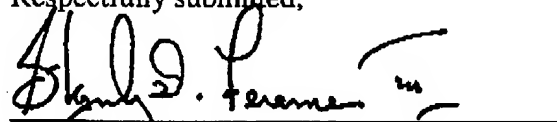
W.L. Gore & Associates, Inc. v. Garlock, 721 F.2d 1540, 1554 (Fed. Cir. 1983); *see also In re Marshall*, 198 U.S.P.Q. 344, 346 (C.C.P.A. 1978).

In view of the foregoing, it is respectfully submitted that Independent Claims 1, 4, 5, 7, 8, and 10-17 are in condition for allowance. By virtue of dependence from what are believed to be allowable Independent Claims 1, 4, 5, 7, and 8, it is respectfully submitted that Claims 2-3, 6, and 9 are also presently allowable. Notice to the effect is hereby earnestly solicited.

The "prior art made of record" has been reviewed. Applicant acknowledges that such prior art was not deemed by the Office to be sufficiently relevant as to have been applied against the claims of the instant application.

In summary, it is respectfully submitted that the instant application, including Claims 1-17, is presently in condition for allowance. Notice to the effect is hereby earnestly solicited. In the unlikely event there are any further issued in this application, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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